

**WASHINGTON**

# **SCIENCE TRENDS**

## **HIGHLIGHTS**

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### **\* MATERIALS RESEARCH PROGRAM EXPANDS**

The Kennedy Administration has proposed a \$1 million increase in materials research programs for the Fiscal Year which begins July 1, 1961. Here is a summary of projects to be expanded and initiated by the U. S. Bureau of Mines:

- ✓ Research on melting and casting molybdenum and tungsten and their alloys.
- ✓ Electrochemical extracting and refining research on the preparation of high-purity, high-strength materials with superior properties over a wide temperature range. This will involve preparation of pure ferroalloy metals and their alloys, and evaluation.
- ✓ Deposition of high-temperature resistant protective films on high-strength, high-temperature materials.
- ✓ Electrochemical process research to develop reduction and purification techniques and equipment for higher purity beryllium, columbium, uranium and thorium. Factors influencing selective solubility, transport and reduction of these metals will be determined, and the physical chemical aspects of electrolyte composition and reaction rate phenomena will be investigated.
- ✓ Research to develop a practical process for shaping materials such as the oxides, nitrides, carbides and borides of rare metals will be stressed. This will involve the very rapid heating of pressed compacts followed by almost instantaneous rapid forming.
- ✓ Research to develop a practical means to use more fully the exceptional properties of platinum group metals under high-temperature and corrosive conditions will be another major effort. Initial efforts will be on electrolytic and vapor phase deposition methods of cladding metals with platinum, ruthenium, rhodium or iridium.
- ✓ Studies will be initiated on the production of Mg-Th master alloys through the reduction of thorium chloride with an excess of metallic magnesium.
- ✓ New studies will be undertaken to prepare semiconductor binary mixtures and determine their thermoelectric properties. Composition stability from 0° to 500° C will be investigated, and the corresponding thermoelectric properties will be measured and correlated with the temperature history.
- ✓ Research will be initiated to determine the application of bacterial metallurgy techniques to the selective extraction of rare metal compounds.
- ✓ Research to develop extraction processes for cesium and rubidium will be expanded to include work on preparation and testing of the metals and their compounds. Cesium research will be emphasized because of the potentially greater usefulness of this metal.

\* LABORATORY EQUIPMENT FOR MATERIALS RESEARCH

Here is a summary of major items of equipment proposed for purchase in connection with the expanded materials research program of the U. S. Bureau of Mines. While this listing is tentative, it indicates the type of equipment expected to be purchased; and estimated cost.

- ✓ Albany (Ore.) Research Center: Continuous air analyzer for beryllium, \$8,000; Rectifier, 1,000-ampere capacity as replacement items (10 at \$2,300 each), \$23,000; Hydrostatic pressing vessel, \$6,000; Infrared spectrophotometer, \$15,000; High temperature, controlled atmosphere D.T.A. apparatus, \$8,500; Universal testing--compression, transverse rupture, and tension--40,000-pound capacity, \$6,500; Vacuum pumps--roots blower type (2 at \$5,000 each), \$10,000; Gas chromatograph, high temperature, \$4,500; Instrumentation for solution calorimeter, \$3,500; Multipurpose temperature-programmer unit, \$3,000; Distillation retort, high-temperature, high-vacuum, \$5,000; Recording oscillograph, \$3,000; Thermorecording balance, \$4,000.
- ✓ Reno (Nev.) Research Center: Vacuum-type dehydration unit, \$2,800; Conductivity cells for fused systems studies, \$3,200; Atmosphere and thermal-controlled furnaces including vacuum accessories (2 units), \$44,000; Multipoint recorders for millivolt impulse measurements (2 units), \$50,000.
- ✓ Salt Lake City (Utah) Research Center: Multichannel gamma ray analyzer, \$14,500; Leco analyzer, \$7,500; Emission spectrograph 20-inch plate, \$15,000; Radio frequency electronic generation--10 kilowatt, \$7,000; Frisch grid alpha chamber, \$6,000.
- ✓ Rolla (Mo.) Research Center: Vapor pressure servo regulated apparatus, \$4,300; 1,400° C. furnace, \$5,000; Atomic absorption spectrometer, \$3,500; Vacuum thermo balance, \$13,000; 2,000° C. vacuum annealing and sintering furnace, \$11,000; 20 kilowatt, 450 kilocycle to 2 megacycle, induction unit, \$8,400; Electrona No. 2 thermal analysis unit, \$4,800.
- ✓ Tuscaloosa (Ala.) Research Center: High temperature pressure stainless steel autoclave system, \$15,000; Controlled atmosphere furnace, \$4,000; Carbon resistance furnace, \$5,000.
- ✓ College Park (Md.) Research Center: Computer-microphotometer, \$8,000; Corrosion test cabinet and condenser aerator assemblies, \$6,000; Automatic recording potentiometers (5 units), \$10,000; Electric crucible furnace, \$10,000; Polarograph, \$2,000; 6-kilowatt converter for induction furnace, \$2,500; Ionization thermocouple gage, \$1,000; Platinum-wound tube furnace for controlled atmosphere thermobalance, \$1,500; Hydrogenation apparatus 1,000-milliliter bomb, \$1,500; X-Y recorder for differential thermal apparatus, \$2,000; Automatic 2-color pyrometer for ultrahigh temperatures, \$6,000; Demountable X-ray tube with vacuum systems, \$7,000; Readout circuits for electron probe microanalyzer with proportional counters, pulse-height analyzers, scaler-rate meters, high-voltage suppliers, and recorders (2 units), \$19,000; Modification to electron-probe microanalyzer to permit scanning of electron beam, \$7,000; High vacuum sintering and melting furnace, \$4,500; Transistorized analog computer, \$12,000.

ROYALTY-FREE PATENT

The following invention, developed at U. S. Government expense, is now available to U. S. industry, royalty-free. For patent number, and details on licensing subscribers may write Service Department, Washington SCIENCE TRENDS, National Press Building, Washington 4, D. C.

- MEASURING METAL RESISTIVITY -- This patent covers a device for detecting cracks and voids in metal objects. Measuring is done by inductively applying a signal of alternately long and short duration pulses to the metal.

## R E S E A R C H    R E Q U I R E M E N T S

Here is a new, up-to-date listing of research and development requirements set forth by military or civilian agencies of the U. S. Government. Organizations interested in possible participation in these programs should provide the agency concerned with complete information on facilities, capabilities, etc.

\* LASER RESEARCH -- The Army intends to support basic research pertaining to the generation and detection of coherent narrow band infrared and visible radiation with the expectation that Light Amplification by Stimulated Emission or Radiation (LASER) techniques could have important military applications.

Problem areas said to be of importance include: (1) Quantum theory of coherent radiation processes in macroscopic systems (coupling of a macroscopic system of atoms and molecules to a coherent or partially coherent radiation field; (2) Investigation of energy levels and transition probabilities in various materials for optical pumping - study of possible new methods for affecting the population of quantum states; (3) Research on narrow band quantum filters; (4) Theory of electromagnetic wave fields (modes) between finite and imperfect reflectors - study of other optical arrangements such as fiber bundles and various geometries; and (5) Investigations related to amplitude and frequency modulation of coherent light beams.

(Comments on this program, as well as suggestions of additional areas which should be supported should be directed to Army Research Office, Box CM, Durham, North Carolina, Attn: H. Robl, Director, Physics Division)

\* HELICOPTER ROTOR HUB -- The Army is interested in hearing from organizations with R&D capabilities to conceive a simplified rotor hub system, and to conduct an analytical design study to determine feasibility for Army helicopters.

(Contact Contracting Officer, U. S. Army Transportation Research Command, Ft. Eustis, Va., Attn: Maj. E. S. Wilkinson, citing REF. No. TC-44-177-61 ((Neg 52)) )

\* REINFORCED PLASTICS -- The Army is interested in hearing from organizations with R&D capabilities in the adaptation of reinforced plastics to such Army aircraft components as fuselage, wing, empennage, drive shafting, propeller blades, power transmission systems, landing gears, etc.

(Write Contact Contracting Officer, U. S. Army Transportation Research Command, Ft. Eustis, Va., Attn: CWO W. L. Scroggins)

\* AIRCRAFT SAFETY BELTS -- The FAA is requesting proposals for a complete test program to determine a sound technical basis for evaluating the service life of aircraft seat belt webbing.

(Contact Federal Aviation Agency, Chief, Contracts Division, Bureau of Research and Development, Washington 25, D. C., Attn: RD-85)

\* RELIABILITY ENGINEERING -- The Navy is interested in locating firms with demonstrated capabilities in the field of reliability engineering, particularly in such areas as reliability training, mathematical formulae for reliability, reliability specifications for Navy weapon systems, etc. to determine the feasibility of stated numerical reliability requirements.

(Complete background should be furnished by June 1, 1961, to Chief, Bureau of Naval Weapons, Attn: Code RREN-8, Washington 25, D. C.)

\* AIR LAUNCHED SONOBUOYS -- This Navy requirement calls for design, development and testing of aircraft launching equipment for sonobuoys of 4 7/8 inch diameter by 36 inches in length. Contractor must have experience in launcher design and production and airborne weapons ejection techniques, with a knowledge of electromagnetic radiation hazards and cartridge actuation devices.

(Contact Bureau of Naval Weapons, Attn: NPR-31, Washington 25, D. C. by May 18, 1961 regarding RFP 5149-61)

\* MILITARY LABORATORIES AND TECHNICAL FACILITIES

Here is a concise summary of laboratories and technical facilities of interest to the Army, Navy and Air Force. Some of these projects are new, some are extensions of previous programs, some are modifications. This annual SCIENCE TRENDS survey has proven to be particularly valuable for organizations which market laboratory and other technical apparatus:

- ✓ Supertoxic Laboratory, Army Chemical Center, Md. -- For research and development in the field of nerve gases and other lethal and incapacitating compounds. Will include laboratory equipment, and provide for the minimum number of technical personnel isolated in closed systems and in facilities integrated with change and shower rooms, isolated modules, emergency exits, facilities for scrubbing off effluent gases and increased fume-hood exhausts.
- ✓ Nuclear Power Training Building, Ft. Belvoir, Va. -- Beginning in Fiscal, 1962, the Army intends to train three classes per year of 50-60 students per class at this school in the operation and maintenance of all ground nuclear powerplants for the three services. New and additional training equipment may be required.
- ✓ Gas Turbine Instruction Building, Ft. Belvoir, Va. -- This will be a new facility for training of operators of gas-turbine powered electrical generators for use with the Sergeant, LaCrosse and Pershing missile systems and for use with the AN/MPQ-32 radar set. Special facilities will be required because of high exhaust temperatures, fire hazard, high speed (up to 30,000 rpm) disintegration hazard and extreme noise levels (up to 110 decibels).
- ✓ Radiation Application Laboratory, Aberdeen Proving Ground, Md. -- This will be used for studies of the application of radioactive tracers and ionizing radiation to Ordnance problems, including the study and evaluation of diffusion and transmission characteristics of various materials when exposed to nuclear radiation. The trace techniques include the study of gas motion in rockets, erosion studies in guns and rockets, and solid state research. Research in nuclear detection entails studies of particle damage and fatigue effects in scintillation crystals, development of new detectors, and maintenance and improvement of existing equipment.
- ✓ Oceanography Station, Nantucket Island, Mass. -- This station was established in 1955 as one of the links in a chain of similar stations to conduct oceanographic, and (presumably) antisubmarine warfare research. The Navy has decided to replace temporary facilities with permanent construction, particularly for the housing of delicate electronic equipment.
- ✓ Polaris Overhaul Facilities, Naval Shipyard, Portsmouth, N. H. -- Additions to this installation include equipment for the overhaul and repair of Polaris missile-launching tubes, air systems, launch valves and other large launching hardware items; special facilities for the repair, test and check-out of various components of the submarine's fire control and navigation subsystems, primarily in a controlled atmosphere environment.
- ✓ Combat Information Center School, Glynco, Ga. -- Additional training facilities are required for instruction in new concepts and doctrines being introduced into the fleet as a result of the development of the naval tactical data system (NTDS) and air tactical data system (ATDS). These systems, the Navy points out, provide a greatly increased capability for simultaneous tracking of multiple targets, with the related problems of intercept, air traffic control, threat evaluation and weapon assignment on a programmed computer basis. New equipment will introduce relative motion and high-speed tracking simulation into the training system.

(Continued)

\* MILITARY LABORATORIES AND TECHNICAL FACILITIES (Continued)

- ✓ Full Pressure Suit Facilities, various locations -- The Navy is introducing this type of facility at four naval air installations. Each will have buildings specially designed to support squadrons flying aircraft which utilize full pressure suits. The use of such a suit permits a pilot to operate, without physiological damage, high performance aircraft above altitudes of 50,000 feet, heights at which the maximum combat effectiveness designed in the planes can be attained. The proposed buildings must have temperatures controlled to 75° to 80°, and relative humidity in the 45% to 55% range.
- ✓ Quality Evaluation Laboratory, Naval Ammunition Depot, Concord, Calif. -- This facility was originally established to conduct tests on conventional ordnance. Recently, the Navy reports, it was assigned added tasks which include: coordination responsibility for all surveillance work in air-launched guided missile guidance and control sections; application of nondestructive testing techniques to all naval weapons including Polaris; designing test procedures and test equipment for nuclear weapons components and development of universal automatic test equipment for use in all Navy quality evaluation laboratories.
- ✓ Shock Test Facility, Naval Ordnance Laboratory, White Oak, Silver Spring, Md. -- The Navy states that no civilian or Defense Department Laboratory facility has the capability of conducting full-size weapon system shock tests. The proposed facility will be capable of shock-testing a 500-pound assembly up to 10,000 times the force of gravity, and launching 1,500 pound ordnance structures at speeds up to 1,200 feet per second. The Navy states that this will eliminate the need for expensive and often premature field tests which yield little qualitative data. It is estimated that the facility will amortize itself on field test savings alone, in approximately 30 months, exclusive of delivery aircraft, recovery, ship expenses, and military manpower. The facility would be available to all Department of Defense agencies and their contractors, when not in use by the Navy.
- ✓ Naval Schools, Mare Island, Vallejo, Calif. -- Instruction facilities here will provide equipment for the training of selected naval personnel in the operation, maintenance and repair of the Polaris and surface-to-air missile weapons systems, and maintenance and repair of the naval tactical data systems.
- ✓ Aeronautical-Astronautical Propulsion Laboratories, Monterey, Calif. -- This project is designed to provide modernly equipped laboratories for use by students and faculty at the Naval Postgraduate School. Studies are related to rocket motors, jet engines, turbines and similar subjects.
- ✓ ASW School, Norfolk, Va. -- This facility will include a modern trainer for training personnel in the tactics and techniques of using aircraft, surface ships and submarines as a team in antisubmarine warfare.
- ✓ Aerospace Environmental Chamber, Arnold Engineering Development Center, Tenn. -- This is essentially a large vacuum chamber which can be used for full-scale environmental testing of primary military satellite vehicles. Thermal radiation and the "heat sink" of space can be simulated, so that the total environment resembles that at 200 miles.
- ✓ Radiation Physics Electronic Laboratory, L. G. Hanscom Field, Mass. -- This facility is for the study of radiation effects on electronic materials.
- ✓ Special Computation Laboratory, L. G. Hanscom Field, Mass. -- This facility will house specialized computers and ancillary equipment necessary for computational support of scientific programs, otherwise not identified.
- ✓ Missile Research Laboratory, Cap Canaveral, Fla. -- This laboratory, and additional facilities, will be used for a variety of technical programs connected with the Dynasoar program.

P U B L I C A T I O N   C H E C K L I S T

- RESEARCH AND DEVELOPMENT FOR DEFENSE, a transcript of Congressional testimony covering a wide variety of subjects by representatives of the Army, Navy and Air Force. 178 Pages. Single Copies Free. (Write Committee on Science and Astronautics, New House Office Building, Washington 25, D. C.)
- RESEARCH AND DEVELOPMENT AND THE GROSS NATIONAL PRODUCT, a study by the National Science Foundation of the "relatively small proportion" of the total national output which is expended on research and development. 8 Pages. 10 Cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication NSF 61-9)
- WORLD MINING AND PETROLEUM LAWS, the first compendium of its kind, presenting highlights of mining and mineral land tenure laws of more than 100 countries. Includes references to sources of further, more detailed information. 215 Pages. \$1. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Bureau of Mines Inf. Circ. No. 8017)
- NUMERICAL DATA PROJECTS, a directory listing more than 30 groups that compile scientific numerical data on a continuing basis. Covers the following categories: physiochemical, crystallographic and mineralogical, nuclear physics, thermophysical and spectroscopic. 66 Pages. \$1. (Write Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, N. W., Washington 25, D. C. for Publication No. 837)
- TECHNICAL JOB DESCRIPTIONS, a new listing and explanation of 65 technical occupations in such fields as aircraft, missiles, electronics and atomic energy research. 50 Cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for "Technical Occupations in Research, Design and Development")
- BASIC PRINCIPLES OF V/STOL AERODYNAMICS, a review of some of the principle factors that determine the performance of such aircraft in hovering, transition and cruise. 17 Pages. Single Copies Free. (Write National Aeronautics and Space Administration, ATTN: Code BID, 1520 H Street, N. W., Washington 25, D. C. regarding NASA Technical Note D-733)
- RECENT DEVELOPMENTS IN TITANIUM AND TITANIUM-ALLOY TECHNOLOGY, a summary of some recent developments which may influence the expanding use of titanium and titanium alloys in the years to come. 5 Pages. Single Copies Free to Government agencies, contractors, subcontractors and their suppliers. (Write Defense Metals Information Center, Battelle Memorial Institute, Columbus 1, Ohio regarding DMIC Memorandum No. 93)
- INDEX OF PUBLISHED INFRARED SPECTRA, a British Ministry of Aviation publication in two volumes covering nearly 10,000 references, including most of the spectra published up to 1957. A third volume is in preparation. 816 Pages. \$18. (Write British Information Service, 45 Rockefeller Plaza, New York 20, N.Y.)
- NAVAL NUCLEAR PROPULSION TRAINING, a catalog providing information on the U. S. Navy's nuclear training schools and programs. 31 Pages. 30 Cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication No. D 208.2:N88/2)

